HW/due (today+1)

day 54

4.1/ 68-70, 76, 78

4.2/ 41-44, 49, 53, 57-60 AND 3.11/31-33

4.3/ 1-8

HW/ due after ↩ 4.1/80-81

4.2/54, 61-62, 71-74, 83

4.3/9-10, 15-16, 21-24

HW/ due later but not too late 4.1/ 79, 82 4.3/25-27, 37,

4.2/84-87 43-45, 50

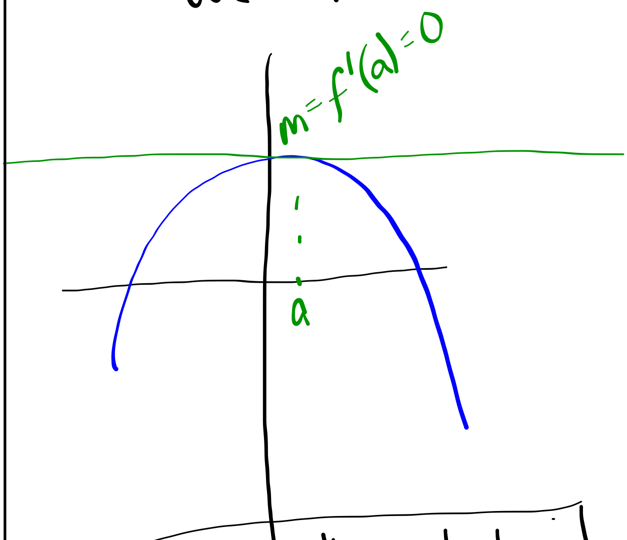
Nov 15-7:13 AM

day 54

Another use for concavity (and the second derivative)

when the second derivative exists (and ∴ the first derivative and ∴ the original function ...)

we have this situation for a local maximum ...



If $f(x)$ has a horizontal tangent at $x = a$, AND if $f(x)$ is concave down, [[i.e. $f''(a) < 0$] $f''(a)$ is NEG]

THEN $f(x)$ has a relative maximum at $x = a$

i.e. "id est" = that is

e.g. "exempli gratia" = for example

Latin you should know

day 54

You are being trained as
function doctors

$f(x)$ .... "Dr Tiff"
- horizontal
- 2 vertical asymptotes

$f'(x)$ * $f'(x)=0$, $f'(x)$ undefined

WHY? we COULD have a maximum or minimum there

first derivative test

essentially... create a sign chart of $f'(x)$

intervals of $f(x)$ increasing + decreasing

before critical pt	crit pt =0, und	after crit pt
pos	rel max	neg
pos	hor tang	pos
neg	||	neg
neg	rel min	pos

second derivative test

find the second derivative AT THE CRIT. PT.
$f'(a)=0$

$f''(a)$	diagnosis
negative	rel max
positive	rel min
0	IDK

day 54

Dr Tiff, episode 2

diagnosing from $f''(x)$

* create a sign chart of $f''(x)$

$f''(x)$ + + 0 – – 0 + +

⇒ intervals where the f^n is concave up or concave down

inc vs dec		con-up vs con-dn
inc	e^x-like	con up
inc	$\ln x$	con dn
dec	exp decay	con up
dec		con dn

A point of inflection is where concavity changes.

Pt of inflection candidates are:
when $f''(x)=0$
OR
$f''(x)$ und

how do I determine YAY or NAY?
sign chart of $f''(x)$
check surrounding $f''(x)$ for (pos, neg)

day 54

4.1/40) $f(x)=\dfrac{x}{(x^2+3)^2}$ on $[-2,2]$

crit pt
abs extr
graph

a) $f'(x)=\dfrac{\frac{d}{dx}(x)\cdot(x^2+3)^2-x\frac{d}{dx}(x^2+3)^2}{((x^2+3)^2)^2}$

$=\dfrac{(x^2+3)^2-x\left(2(x^2+3)^1\left(\frac{d}{dx}(x^2+3)\right)\right)}{((x^2+3)^2)^2}$

$=\dfrac{(x^2+3)^2-2x(x^2+3)(2x)}{(x^2+3)^4}=\dfrac{(x^2+3)\left[x^2+3+4x^2\right]}{(x^2+3)^4}$

b) $f'(x)=0 \Rightarrow 5x^2+3=0 \quad x=\pm\sqrt{-\frac{3}{5}}$ oops none

$f'(x)$ undefind $\Rightarrow (x^2+3)^3=0 \Rightarrow x^2+3=0$

$\Rightarrow x=\pm\sqrt{-3}$ oops none

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day 54

2	2	2	4	5	4	2	3	4	3	4	2	2	5	3	
1	2	3	4	5	6	7a	7b	8	9	10	11	12	14	15	

points

q #

supposed $(2x+3)$

$$2x+3\frac{d}{dx}(3x^2-2)$$

$$=(2x+3)(6x)$$

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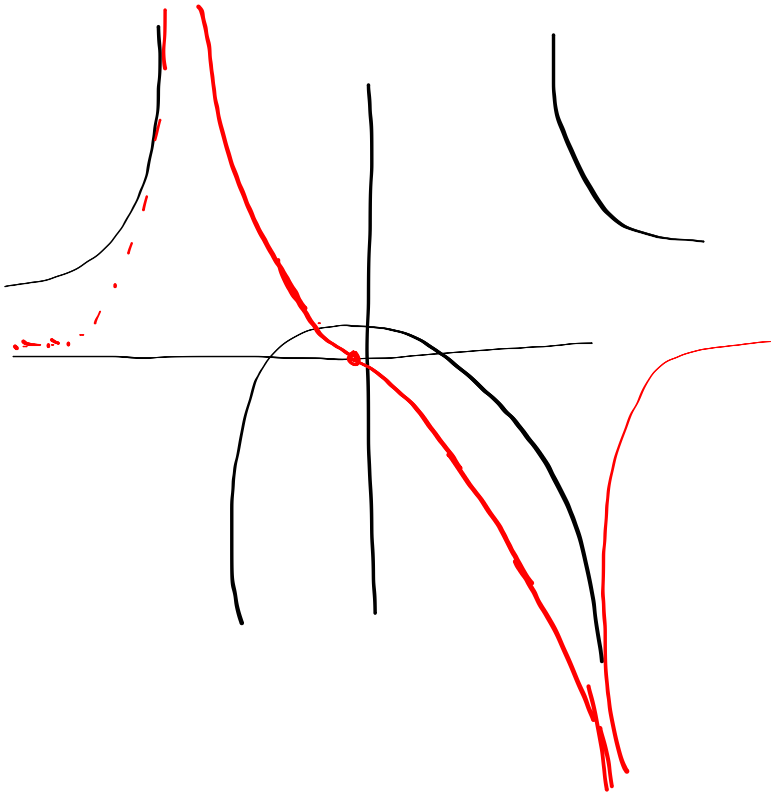
12

$$\lim_{x \to 0} \frac{\sin(3x)}{\cos(4x)} = \frac{\sin(0)}{\cos(0)} = \frac{0}{1} = 0$$

15

sketch the deriv



day 54

14) $x(t) = -t^2 + 4t - 3, \quad 0 \le t \le 5$

$x'(t) = v(t) = -2t + 4$

moving left: $(2, 5]$

moving left $= v(t) < 0$

moving right: $[0, 2)$

moving right $= v(t) > 0$

$v(t) = 0 \Rightarrow -2t + 4 = 0$

$t = 2$

s.c.

$v(t)$ + + + 0 - - - -

0 2 5

$a(t)$ - - - - - - -

speeding up: $(2, 5]$

sign of $v(t)$ = sign of $a(t)$

$a(t) = -2$